

**APPENDIX C**

**TRANSIT FLEET VEHICLE EMISSIONS INVENTORY**



The EMFAC model used by the Air Resources Board (ARB) does not specifically address the emissions inventory of vehicles owned or operated by transit agencies. These vehicles are included as buses and trucks as part of the heavy-duty diesel truck fleet. This is largely because of the lack of emission and activity data specific to transit agency vehicles.

Transit fleet vehicles (TFVs) operate differently from trucks driving on highways or freeways. While some vehicles operate on highways and freeways, most operate within cities or urban areas, in fixed or on-demand routes. In addition, ARB has not previously needed a specific inventory for TFVs. As ARB developed this regulation, however, staff required a more detailed inventory of TFV emissions than was previously available.

The following sections discuss the population and present an emissions inventory for TFVs in California.

## A. Transit Fleet Vehicle Population and Activity Data

Transit fleet vehicles are those vehicles that are operated or owned by transit agencies but which are not urban buses. This distinction is important because new urban bus engines are certified to more stringent exhaust emission standards than are trucks, at least until 2010, and because ARB has an adopted rule that forces transit agencies to reduce emissions, on a fleet-wide basis, of oxides of nitrogen (NOx) and diesel particulate matter (PM). The following discussion provides detailed information on how ARB determined the number and characteristics of transit fleet vehicles.

### 1. Engine Exhaust Emission Standards

The following tables (Tables 1-5) illustrate the differing certification standards for engine exhaust emissions from urban buses and trucks.

**Table 1. California and Federal NOx Emission Standards for Urban Bus Engines**

Emission Standards (g/bhp-hr)		
Model Year	California	Federal
1988	6.0	10.7
1990	6.0	6.0
1991	5.0	5.0
1996	4.0	5.0
1998	4.0	4.0
October 2002	2.2 <sub>(1)</sub>	2.2 <sub>(1)</sub>
2004	0.5 <sub>(2)</sub> , 2.2 <sub>(3)</sub>	2.2 <sub>(1)</sub>
2007	0.2 <sub>(4)</sub>	1.2 <sub>(4)</sub>
2010	0.2 <sub>(4)</sub>	0.2 <sub>(4)</sub>

1. Nominal expected NOx level based on emission standards of 2.4 g/bhp-hr NOx plus non-methane hydrocarbons (NMHC) or 2.5 g/bhp-hr NOx plus NMHC with 0.5 g/bhp-hr NMHC cap to take effect in October 2002 for those engines subject to the Settlement Agreements between the heavy-duty engine manufacturers, the United States Environmental Protection Agency

(U.S. EPA), and ARB. As part of the Settlement Agreements, the federal heavy-duty engine emission standards adopted for 2004 took effect in October 2002.

2. Standard applies to urban bus equipped with diesel-fuel, dual fuel, or bi-fuel, engines.
3. Standard applies to urban bus equipped with alternative-fueled engines. Nominal expected NOx level of 2.2 g/bhp-hr is based on ARB emission standards of 2.4 g/bhp-hr NOx plus NMHC or 2.5 g/bhp-hr NOx plus NMHC with 0.5 g/bhp-hr NMHC.
4. Between 2007 and 2009, U.S. EPA requires 50 percent of heavy-duty diesel engine family certifications to meet the 0.2 g/bhp-hr NOx standard. Averaging is allowed, and it is expected that most engines will conform to the fleet NOx average of approximately 1.2 g/bhp-hr.

**Table 2. California and Federal PM Emission Standards for Urban Bus Engines**

Emission Standards (g/bhp-hr)		
Model Year	California	Federal
1988	0.6	0.6
1991	0.1	0.25
1993	0.1	0.1
1994	0.07	0.07
1996	0.05 <sub>(1)</sub>	0.05 <sub>(1)</sub>
October 2002	0.01 <sub>(2)</sub>	0.05 <sub>(1)</sub>
2007	0.01	0.01

1. In-use standard of 0.07 g/bhp-hr.
2. Standard applies to urban bus equipped with diesel-fuel, dual fuel, or bi-fuel, engines. Urban bus equipped with alternative fueled engines may certify to optional standard of 0.03, 0.02, or 0.01 g/bhp-hr.

**Table 3. California Optional, Reduced-NOx Emission Standards for Urban Buses**

Emission Standard (g/bhp-hr)		
Model Year	Optional Standards	Increment
2000	2.5 - 0.5	0.5
October 2002	1.8-0.3 <sub>(3)</sub>	0.3
2004 – 2006 <sup>(1,2)</sup>	1.8-0.3 <sub>(3)</sub>	0.3

1. Emission standards apply only to alternative fueled engines.
2. Engine manufacturers may sell diesel hybrid-electric buses certified at 1.8 g/bhp standard to transit agencies with approved NOx offset plans.
3. Optional emission standards of 1.8 – 0.3 g/bhp-hr are for NOx plus non-methane hydrocarbons (NMHC). Engines certified to the optional NOx standard are excluded from participating in the Averaging, Banking and Trading (ABT) program.

**Table 4. California and Federal NOx Emission Standards for Heavy Duty Truck Engines**

Emission Standards (g/bhp-hr)		
Model Year	California	Federal
1988	6.0	10.7
1990	6.0	6.0
1991	5.0	5.0
1996	5.0	5.0
1998	4.0	4.0
October 2002	2.2 <sub>(1)</sub>	2.2 <sub>(1)</sub>
2004	2.2 <sub>(1)</sub>	2.2 <sub>(1)</sub>
2007	1.2 <sub>(2)</sub>	1.2 <sub>(2)</sub>
2010	0.2 <sub>(2)</sub>	0.2 <sub>(2)</sub>

1. Nominal NOx value of 2.2 g/bhp-hr is based on emission standards of 2.4 g/bhp-hr for NOx plus non-methane hydrocarbons (NMHC) or 2.5 g/bhp-hr NOx plus NMHC with 0.5 g/bhp-hr NMHC cap, which took effect in October 2002 for those engines subject to the EPA Consent Decrees and the California Settlement Agreements. The Consent Decree-complying engines had to comply with 2004 standard by October 1, 2002.
2. Between 2007 and 2009, U.S. EPA requires 50 percent of heavy-duty diesel engine family certifications to meet the 0.2 g/bhp-hr NOx standard. Averaging is allowed, and it is expected that most engines will conform to the fleet NOx average of approximately 1.2 g/bhp-hr.

**Table 5. California and Federal PM Emission Standards for Heavy Duty Truck Engines**

Emission Standards (g/bhp-hr)		
Model Year	California	Federal
1988	0.6	0.6
1991	0.25	0.25
1993	0.25	0.25
1994	0.10	0.10
2007	0.01	0.01

## 2. Department of Motor Vehicles Database

In January 2004, staff conducted a data extraction of the 2002 Department of Motor Vehicles (DMV) database. The search criteria included "YY" - cutaway and "BU"- bus Body\_Type\_Models that resulted in 50550 "BU" records and 3076 "YY" records. The data were extracted from DMV2002B, which was extracted by the DMV in late September 2002. Staff's best guess is that it represents about the first 9 months of 2002.

Staff evaluated each record and placed the record into one of four different bins: a) reporting urban bus (UB) fleet; b) new TFV fleet, including reporting UB fleet, TFVs, and new non-reporting TFVs; c) Public Fleets, such as airports, police department, prisons,

universities and colleges; d) other, including tribal fleets. Private vehicles used solely for private applications and school districts were deleted from the database. Using a web search and a membership list from the California Association for Coordinated Transit (Cal/ACT), staff followed up on unknown ownership names and deleted vehicles falling into one of the following categories: vehicle owner that does not conduct transit operations, vehicle is not owned by a public transit agency, or the vehicle is not under contract to a public agency. Other vehicles in the DMV database were cross checked with survey data. Additional deletions included sold or "graveyard" vehicles not operating but still on the DMV database and school buses identified by a DMV analysis conducted for the NOx reflash requirements (discussed below).

Staff identified that 6.8 percent of the vehicles in the DMV data extraction were listed under a financial institution or leasing corporation name. In addition, the DMV data extraction did not include trucks. The truck population represented 1.2 percent of the survey data population. After determining the total vehicle numbers above, the final total number was increased by 8 percent to account for the ownership by the financial institutions and to include trucks. The final 2003 TFM population was estimated to be 5,411 vehicles.

### **3. Transit Fleet Vehicle (non-urban bus) Survey**

From April through December 2003, staff conducted a survey of reporting and non-reporting transit agencies. Reporting transit agencies are those that have been reporting to the ARB since adoption of the Fleet Rule for Transit Agencies in 2000. The survey was included in the annual reporting forms for the agencies subject to the current Fleet Rule for Transit Agencies. In addition, the survey was distributed by e-mail to the 250 Cal/Act membership which consists of smaller, rural and paratransit agencies, a majority of which were not subject to the current Fleet Rule for Transit Agencies and was distributed at the California Transit Association November 2003 conference. Other surveys were distributed as contacts were developed. Ninety-one transit agencies responded to the survey, reporting a total of 2,187 buses and trucks that would be included in the definition of transit fleet vehicle. Table 6 lists the total vehicles by transit agency. Gasoline vehicles and transit agencies operating only gasoline vehicles are not included.

Eighty-one percent of the reporting transit agencies and 15 percent of the non-reporting agencies responded to the surveys. The percentage of non-reporting agencies was determined by using dividing the number of non-reporting surveys received by the number of individual agencies identified from the DMV data that currently are not subject to the Fleet Rule for Transit Agencies, not including contracting companies. Seventy four percent of the surveyed vehicles were reported from transit agencies currently subject to the regulation. Staff categorized the reported vehicles by model year (MY), fuel type, and <14,000 pounds (lbs), 14,000-33,000 lbs, and >33,000 lbs gross vehicle weight rating (GVWR) (Table 7).

**Table 6. Transit Agencies and Vehicle Population from Survey<sup>1,2</sup>**

<b>Transit Agency</b>	<b>Total</b>	<b>Transit Agency</b>	<b>Total</b>
A/C Transit	49	Paratransit, Inc. (Sacramento) <sup>1</sup>	42
Amador Regional Transit <sup>1,2</sup>	10	Placer County	16
Antelope Valley Transit Authority	9	Plumas County Transit <sup>1,2</sup>	4
Arcata & Mad River Transit System <sup>2</sup>	2	Porterville <sup>1,2</sup>	10
Auburn <sup>1,2</sup>	3	Redding Area Bus Authority	19
Barstow Area Transit <sup>1,2</sup>	13	Riverbank-Oakdale Transit Authority <sup>1,2</sup>	9
Butte County	13	Riverside <sup>1</sup>	19
Calaveras Transit <sup>1,2</sup>	5	Riverside Transit Agency	19
Chico Area Transit System	3	Roseville	12
Chula Vista Transit	2	Sacramento Regional Transit District	23
Corcoran <sup>1,2</sup>	8	San Benito Co. Local Trans. Authority <sup>1,2</sup>	7
Eastern Contra Costa Transit Authority	25	San Francisco Municipal Railway	1
El Centro (Dial-a-Ride) <sup>1,2</sup>	3	San Joaquin Regional Transit District	42
El Monte <sup>1</sup>	10	San Luis Obispo Transportation Auth. <sup>2</sup>	11
Fairfield/Suisun Transit	14	San Luis Obispo <sup>2</sup>	1
Folsom	12	San Mateo County Transit District	48
Fresno County EOC <sup>1</sup>	43	Santa Barbara County Association of Gov.	4
Gardena Municipal Bus Lines	1	Santa Barbara Metropolitan Transit Dist.	15
Golden Empire Transit District	18	Santa Clara Valley Transportation Auth.	13
Golden Gate Transit	4	Santa Clarita Transit	18
Humboldt Transit Authority <sup>2</sup>	3	Santa Cruz Met. Transit District	11
Imperial County Transit	10	Santa Maria Area Transit	9
Imperial <sup>1,2</sup>	2	Santa Monica Big Blue Bus	19
Inyo Mono Transit <sup>1,2</sup>	2	Santa Rosa City Bus	12
Kern Regional Transit <sup>1</sup>	61	SD Metropolitan Transit Dev. Board	150
Kings County Area Public Transit	1	Simi Valley Transit	11
Lake Transit Authority <sup>1,2</sup>	13	Siskiyou County STAGE <sup>2</sup>	11
Lincoln <sup>2</sup>	1	Sonoma County Transit	16
Livermore/Amador Valley Transit Auth.	28	South Coast Area Transit	16
Long Beach Transit	33	South Lake Tahoe <sup>2</sup>	2
Los Angeles DOT	53	Stanislaus Regional Transit	11
Mendocino Transit Authority <sup>2</sup>	1	SunLine Transit Agency	29
Modesto	12	Tehama <sup>1,2</sup>	10
Modoc Transportation (Sage Stage) <sup>1,2</sup>	2	Thousand Oaks	3
Montebello	3	Torrance Transit System	14
Monterey Park <sup>1</sup>	7	Unitrans	10
Monterey-Salinas Transit	15	Vacaville	5
North County Transit District	31	Victor Valley Transit Authority	10
Norwalk	5	West Hollywood <sup>1,2</sup>	1
Orange County Transportation Authority	329	Yolobus	6
Palo Verde Valley Transit <sup>1,2</sup>	8	Yuba-Sutter Transit <sup>1</sup>	37

<sup>1</sup> Transit Agency is currently not subject to the Fleet Rule for Transit Agencies.

<sup>2</sup> Population of Transit Agency's service area is less than 50,000.

**Table 7. Survey Population Distribution by Gross Vehicle Weight (GVWR) and Fuel Type**

<b>Gross Vehicle Wt.</b>	<b>Diesel</b>	<b>Gasoline</b>	<b>Alternative Fuel</b>	<b>Electric</b>	<b>Total</b>	<b>% By GVWR</b>
<14,000	342	164	63	0	569	<b>26.0%</b>
>14,000	1028	381	155	5	1569	<b>71.7%</b>
>33,000	49	0	0	0	49	<b>2.2%</b>
<b>Total</b>	<b>1419</b>	<b>545</b>	<b>218</b>	<b>5</b>	<b>2187</b>	<b>100.0%</b>
<b>Percent By Fuel</b>	<b>64.9%</b>	<b>24.9%</b>	<b>10.0%</b>	<b>0.2%</b>	<b>100.0%</b>	

#### **4. Analysis of Transit Fleet Vehicle Population Data**

Staff compared the fuel and GVWR distribution of the survey and DMV data. Staff used the fuel, MY, and GVWR classification percentages derived from the survey, rather than from the DMV database because the DMV data appeared to under represent diesel vehicles, skew the model year distribution to older vehicles, over represented <14,000 GVWR and >33,000 lb GVWR class.

The DMV data appeared to under-represent diesel vehicles as much as by 13 percent. Staff accounted for the difference for the reporting of one common engine type that could be diesel or gasoline. Staff had initially identified those vehicles as all gasoline, but determined that some were diesel-fueled.

The DMV database appeared to skew the model year distribution toward older vehicles. This is most likely the result of the DMV database data representing vehicles two years older at the time of extraction and older "retired" vehicles owned by transit agencies, but not being operated (waiting for auction or stored in the back lot), remaining on the DMV database.

The GVWR weight distribution over represented <14,000 GVWR and >33,000 GVWR classes compared to the survey data. Staff believed this is the result of using GVWR DMV classifications of 2 and 3 for the <14,000 GVWR class. The range for the DMV Classifications 2 and 3 are 6,501 lbs to 10,000 lbs, and 10,001 lbs to 14,000 lbs, respectively. To adjust for the lighter vehicles, staff reviewed the DMV data and deleted vehicle classifications and engine sizes that were not used for the heavy-duty engine certification such as passenger cars, medium duty vehicles and light duty trucks. The >33,000 lb GVWR category, as discussed previously, contained school bus information and older "retired" vehicles. To correct for the >33,000 GVWR classification, staff deleted the school bus data obtained for the analysis of the NOx retrofit regulation. In addition, staff compared fleet number and make up with the surveys received and deleted older vehicles not in operation.

As previously stated, the baseline population was based on the ending population after staff's manipulation of the DMV data extraction and survey analysis. The final data

represented buses most likely operated by a transit agency. This value did not include vehicles owned by a financial institution or trucks. Staff only extracted vehicle data that met database body type definition of "bus" or "cutaway" from the DMV database therefore trucks were not included in the final number. To adjust for these two factors, staff increased the total number of vehicles after DMV data extraction by 8 percent to reflect the portion of vehicles currently owned by a financial institution but operated by a transit agency (6.8 percent of the DMV data) and to include the truck population (1.2 percent of the survey data). Including all fuels, staff determined that the total of TFFVs equals 5,411.

For the purpose of emissions inventory calculation, the TFFVs were grouped into the following three different classes according to their GVWR:

- Light heavy-duty TFFVs (LHTFFV): 14,000 lbs or less;
- Medium heavy-duty TFFVs (MHTFFV): 14,001 to 33,000 lbs;
- Heavy heavy-duty TFFVs (HHTFFV): 33,001 lbs or more.

To estimate population data for emissions inventory calculation, staff applied the fuel, MY, and GVWR distributions obtained from the transit fleet survey to the total TFFV population determined above to obtain the 2003 population distribution by GVWR and fuel type. Finally, as the proposed regulation does not regulate gasoline vehicles, vehicles fueled by gasoline were deleted from the total TFFV population, resulting in a final TFFV population of 4,054. Five electric vehicles (classified as alternative fuel vehicles) reported in the survey data were not included in this analysis.

## **5. Transit Fleet Vehicle Activity Data**

The following transit fleet activity data were then estimated for each group of vehicles:

- Annual mileage accrual rate;
- Population (POP) and age distribution;
- Total vehicle miles traveled (VMT).

The annual mileage accrual rate for TFFVs was estimated from the annual mileage data provided by transit fleet agencies. Because of the considerable scatter in the annual mileage data, a population-weighted annual average was calculated from the annual miles of individual model years and used for all model years of TFFVs.

Statewide fleet populations of 3,504 and 550 vehicles were estimated for diesel and alternative fuel TFFVs, respectively, for 2003. The age distributions (number of vehicles by age) for diesel and alternative fuel TFFVs were also calculated using transit fleet survey data.

The population for future years was projected based on the following assumptions:

- A growth rate of 1.5% was used for the fleet between Years 2004 and 2020; This value is based on the growth rate observed from transit agencies currently reporting under the Fleet Rule for Transit Agencies;

- Since the population data from transit fleet agencies could not provide information on fleet turnover, the survival rate of heavy heavy-duty trucks from EMFAC was used for diesel TFVs of 33,001 and greater GVW and the rate of urban diesel buses was used for TFVs of 33,000 lb or less GVW (survival rate quantifies the fraction of new vehicles that remain in the fleet after certain years).

The populations of diesel and alternative fuel TFVs for 2004 and later model years were estimated using their 2003 populations as the base year. The projected populations for future years were adjusted using the fleet growth rate and vehicle survival rates.

The TFV mileage accrual rate, survival rate, and population distribution for years 2003 and 2020 are given in Tables 12 through 14.

The TFV daily VMT for any given year was estimated from the population (POP) and accrual rate using the following equation:

$$\text{VMT} = \sum \text{POP}_{\text{age}} \times (\text{Accrual Rate}) \quad (1)$$

where, *age* = 0-22 years for LHTFVs and MHTFVs and 0-45 for HHTFVs.

Table 8 shows the estimated annual VMT of transit fleet vehicles for selected calendar years.

**Table 8. Annual VMTs of Diesel and Alternative Fuel TFVs (in 1,000,000 mile/year)**

Vehicle Group	2000	2004	2005	2010	2015	2020
LHTFV(DSL)	20.2	21.9	22.2	23.9	25.8	27.8
LHTFV(Alt)	3.7	4.0	4.1	4.4	4.7	5.1
MHTFV(DSL)	73.5	79.5	80.7	86.9	93.6	101
MHTFV(Alt)	11.0	12.2	12.2	13.0	14.0	15.1
HHTFV(DSL)	3.3	3.6	3.7	4.1	4.4	4.7

## B. Emission Rates for Transit Fleet Vehicles

The emission rates of diesel TFVs used in inventory calculations are those for light, medium, and heavy heavy-duty diesel trucks in EMFAC2002 (version 2.2; for details of heavy-duty truck emission rates as well as the complete emission rate tables, refer to EMFAC2002 documentation at [www.arb.ca.gov/msei/msei.htm](http://www.arb.ca.gov/msei/msei.htm)).

The emission rates used for alternative fuel TFVs are the same as the rates of alternative fuel transit buses. These rates were estimated from emission data collected by West Virginia University (WVU), which includes emission data of 71 1991-1998 model year CNG powered transit buses. The data were first divided into model year groups corresponding to the model year groups of diesel transit buses and the data in each group was then averaged. Emission rates for model years after 1998 were estimated using the

ratio of the standards. The HC, NOx, and PM emission rates for alternative fuel transit buses are given in Table 9.

**Table 9. Emission Rates of Alternative Fuel Transit Buses (g/mi)**

Model Year Group	HC	NOx	PM
1991-93	14.6	25.4	0.02
1994-95	15.5	11.2	0.02
1996-98	20.7	20.0	0.02
1999-02	20.7	20.0	0.02
2003	7.96	10.0	0.04
2004-06	0.80	2.5	0.04
2007	0.80	1.0	0.04
2008+	0.80	1.0	0.04

### C. Emissions Inventory of Transit Fleet Vehicles

Tables 10 and 11 summaries the NOx and PM baseline inventories of diesel and alternative fuel TFFVs for selected calendar years.

**Table 10. NOx Baseline Inventories of Transit Fleet Vehicles (in lbs/day)**

Vehicle Group	2000	2004	2005	2010	2015	2020
LHTFV(DSL)	960	1,000	1,000	840	440	188
LHTFV(Alt)	420	400	400	340	174	66
MHTFV(DSL)	5,800	5,280	5,240	4,460	2,340	980
MHTFV(Alt)	1,280	1,120	1,100	940	500	200
HHTFV(DSL)	500	400	400	360	280	186

**Table 11. PM Baseline Inventories of Transit Fleet Vehicles (in lbs/day)**

Vehicle Group	2000	2004	2005	2010	2015	2020
LHV(DSL)	8	8	8	8	4	2
LHTFV(Alt)	0.4	0.4	0.4	0.4	0.2	0.2
MHTFV(DSL)	142	134	134	120	72	72
MHTFV(Alt)	1.4	1.0	1.0	0.8	0.6	0.4
HHTFV(DSL)	6	6	6	4	4	2

**Table 12. Accrual Rate, Survival Rate, and Population Distribution of TFVs (14,000 lb or less GWV)**

Age	Accrual Rate (mi/year) <sup>1</sup>	Survival Rate	2003 Diesel Population <sup>2</sup>	2020 Diesel Population <sup>3</sup>	2003 Alt Fuel Population <sup>2</sup>	2020 Alt Fuel Population <sup>3</sup>
0	25,537	1.0000	0	84	35	15
1	25,537	1.0000	22	80	32	15
2	25,537	0.9930	124	77	25	15
3	25,537	0.9930	121	77	22	16
4	25,537	0.9894	17	79	5	17
5	25,537	0.9877	213	84	22	18
6	25,537	0.9840	166	89	2	19
7	25,537	0.9791	116	94	0	18
8	25,537	0.9329	10	90	12	14
9	25,537	0.9329	15	82		12
10	25,537	0.8453	10	73		9
11	25,537	0.7196	7	58		6
12	25,537	0.6022	10	31		4
13	25,537	0.4952	0	21		2
14	25,537	0.3997	2	13		2
15	25,537	0.3166	5	9		1
16	25,537	0.2459	2	5		1
17	25,537	0.1872	2	4		7
18	25,537	0.1395	0	17		4
19	25,537	0.1016	0	12		3
20	25,537	0.0718	2	1		2
21	25,537	0.0296		6		0
22	25,537	0.0007		0		0

1. Population-weighted annual mileage average.
2. Estimated from DMV registration and transit fleet survey data.
3. Projected from year 2003 population and growth rate.

**Table 13. Accrual Rate, Survival Rate, and Population Distribution of TFVs (14,001-33,000 lb GWV)**

Age	Accrual Rate (mi/year) <sup>1</sup>	Survival Rate	2003 Diesel Population <sup>2</sup>	2020 Diesel Population <sup>3</sup>	2003 Alt Fuel Population <sup>2</sup>	2020 Alt Fuel Population <sup>3</sup>
0	30,885	1.0000	7	241	17	36
1	30,885	1.0000	453	242	136	37
2	30,885	0.9930	369	245	106	38
3	30,885	0.9930	460	253	10	40
4	30,885	0.9894	302	265	20	43
5	30,885	0.9877	339	280	22	45
6	30,885	0.9840	163	292	35	48
7	30,885	0.9791	200	287	15	42
8	30,885	0.9329	37	238	12	27
9	30,885	0.9329	30	219	2	25
10	30,885	0.8453	35	162	20	21
11	30,885	0.7196	25	118		14
12	30,885	0.6022	15	75		10
13	30,885	0.4952	30	54		7
14	30,885	0.3997	10	34		6
15	30,885	0.3166	5	28		0
16	30,885	0.2459	35	19		4
17	30,885	0.1872	2	86		25
18	30,885	0.1395	7	51		15
19	30,885	0.1016	10	47		1
20	30,885	0.0718	0	22		1
21	30,885	0.0296	2	10		1
22	30,885	0.0007		0		0

1. Population-weighted annual mileage average.

2. Estimated from DMV registration and transit fleet survey data.

3. Projected from year 2003 population and growth rate.

**Table 14. Accrual Rate, Survival Rate, and Population Distribution of TFVs  
(>33,001 lb GWV)**

Age	Accrual Rate (mi/year) <sup>1</sup>	Survival Rate	2003 Diesel Population <sup>2</sup>	2020 Diesel Population <sup>3</sup>
0	30,244	1.0000	0	11
1	30,244	0.9760	5	10
2	30,244	0.9760	25	10
3	30,244	0.9760	47	10
4	30,244	0.9760	15	10
5	30,244	0.9760	0	10
6	30,244	0.9760	7	9
7	30,244	0.9698	2	8
8	30,244	0.9599	7	7
9	30,244	0.9525	7	6
10	30,244	0.9143	0	5
11	30,244	0.8747	0	4
12	30,244	0.8243	0	3
13	30,244	0.7636	0	3
14	30,244	0.6933	0	2
15	30,244	0.6425	0	2
16	30,244	0.5875	0	3
17	30,244	0.5290	0	3
18	30,244	0.4664	0	12
19	30,244	0.4049	0	19
20	30,244	0.3439	0	5
21	30,244	0.2962	0	0
22	30,244	0.2541	2	2
23	30,244	0.2071	2	0
24	30,244	0.1674	2	1
25	30,244	0.1404	2	1

1. Population-weighted annual mileage average.
2. Estimated from DMV registration and transit fleet survey data.
3. Projected from year 2003 population and growth rate.